CAPILLARY ELECTROPHORESIS DEVICE

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Abstract of **JP6066769**

PURPOSE:To improve the reproducibility of a sample by preventing the flowing in of the sample to flow passages other than a weighing flow passage in a sample introducing element used for capillary electrophoresis.
CONSTITUTION:A capillary 1 is constituted by making a sample leading-in flow passage aa' and analytical flow passage bb' to intersect each other and connecting the passages aa' and bb' to an electrode bath through a sample introducing element 3 which collects samples by fixed amounts through a weighing flow passage cc' at the intersection of the passages aa' and bb'. It is contrived to only lead the sample in the passage cc' to the capillary 1 by providing a partition film 23 at the end of the passage cc' or a level difference in the passage cc'. Therefore, the reproducibility of the sample leading amount can be improved.
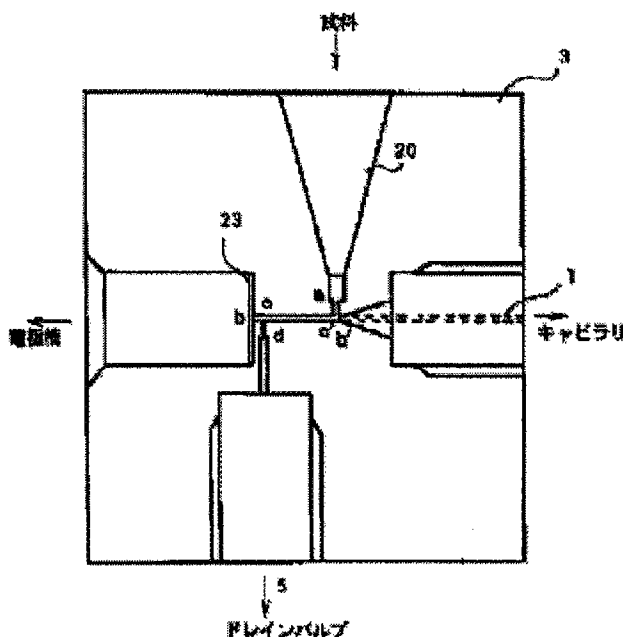
1   CAPILLARY ELECTROPHORESIS DEVICE

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>
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(54)【発明の名称】　キャピラリー電気泳動装置

(57)【要約】

【目的】キャピラリー電気泳動に用いる試料導入素子において、試料が計量流路以外の流路へ流れないようにし、サンプリング再現性を向上させることができるようにする。

【構成】キャピラリー1は、試料導入流路aa′と分析用流路bb′とを交差して構成し、交差部分にあたる計量流路cc′により試料を計り採る試料導入素子3を介して電極槽に接続する。計量流路cc′の終端に隔離膜23を設けるか流路に段差をつけることにより、試料は隣接流路へ流れにくくなるようにし、計量流路部分の試料だけキャピラリー1に導入するようにした。

【効果】試料導入量の再現性が向上した。

図　3
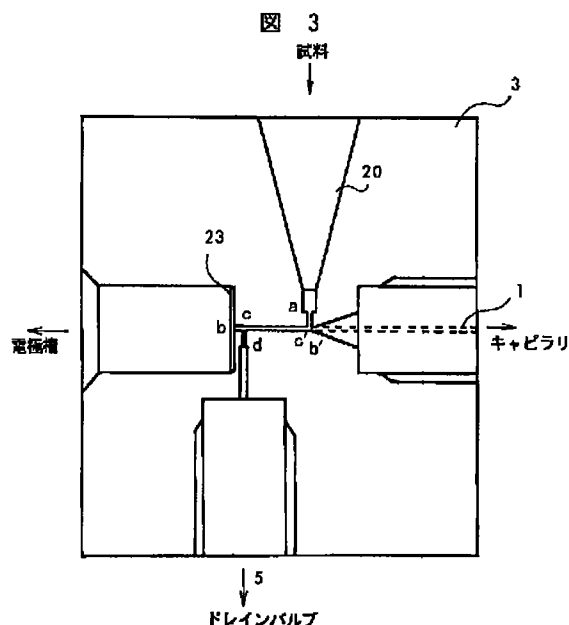
【特許請求の範囲】

【請求項1】液体を満たした毛細管の両端に電圧を印加し、毛細管の一方の端に試料導入素子を介して導入した試料を分離し、検出する分析装置において、上記試料導入素子は分析用流路と試料導入流路とを交差させて構成し、交差部分に当たる計量流路により試料を計り採り、計量流路に隣接する他の流路の容積が計量流路よりはるかに小さいことを特徴とするキャピラリー電気泳動装置。

【請求項2】請求項1記載の試料導入素子において、計量流路に隣接する他の流路の径を計量流路の径より小さくすることを特徴とするキャピラリー電気泳動装置。

【請求項3】請求項1記載の試料導入素子において、計量流路に隣接する他の流路を計量流路より短くすることを特徴とするキャピラリー電気泳動装置。

【請求項4】請求項1記載の試料導入素子において、計量流路の終端に隔離膜を設けることを特徴とするキャピラリー電気泳動装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】液体中の微量成分を分離分析する方法に係り、特にキャピラリー電気泳動のサンプリング再現性の向上に係る。

【0002】

【従来の技術】キャピラリー電気泳動は、高機能液体クロマトグラフィー（HPLC）とゲル電気泳動の利点を合わせ持つ分離分析技術として近年特に注目されている。

【0003】キャピラリー電気泳動については、例えば、アナリティカル　ケミストリー６１巻２９２A頁−３０３A頁（１９８９年）(Analytical Chemistry，6 1，２９２A−３０３A（１９８９）)やアナリティカル　ケミストリー　６１巻１１８６頁−１１９４頁（１９８９年)(Analytical Chemistry，61，１１８６−１１９４（１９８９)) に記載されている。バッファを満たした内径約２５umから２５０umの毛細管を分離媒体として用いる。一方の末端から試料を導入し、この中で試料を電気泳動により分離しながら他方の末端に移動させる。移動方向にある適当な位置に試料成分の通過を検出する検出器を設置しておき、分離パターンを記録する。

【0004】キャピラリー電気泳動において、試料導入法にはいくつかの方法があるが、いずれもキャピラリーを移動させたり、またはバッファ，試料管を交代でキャピラリーにもっていくため、分析再現性を上げる上で問題になっている。これらの方法とは別に、インジェクタを用いた試料導入法が開発されている。この方法については例えばジョナル　オブ　クロマトグラフィー　４５２巻　６１５−６２２頁（１９８８年）(Journal of C hromatography, 452 ６１５−６２２（１９８８)) に記載されている。インジェクタは分析用流路と試料導入流路とを交差させて構成し、交差部分に当たる計量流路によって試料を計り採るため、注入量変動の影響を受けずに良い再現性が得られるのが特徴である。図1にインジェクタの構成とその動作原理を説明する。試料は注入ポートより注入する。計量流路を試料で満たすようにドレイン側のバルブを一定時間開く。その後バルブが閉まる状態で電圧を印加し、計量流路部分の試料が泳動され、キャピラリーに導かれる。

【0005】

【発明が解決しようとする課題】上記インジェクタを用いた試料導入法では、試料が計量流路によって計量されるため、理想的にはサンプリング再現性が良いはずである。しかし実際に図2に示すように、計量流路が隣接する他の流路と物理的に連続しており、試料注入の際、試料が流体力学に従って隣接流路へ流入し、理想的な計り採りができない。この点はとくに計量流路の容積が小さいときに問題となっている。

【0006】本発明の目的は、サンプリングの再現性を向上させることにある。

【0007】

【課題を解決するための手段】上記課題を解決するには、以下の方法で隣接流路の容積を低減または遮断させれば良い。

【0008】隣接流路の径を計量流路の径より小さくする。すなわち流路に段差を設け、抵抗の違いにより試料が隣接流路への流れ込みを低減させる。

【0009】隣接流路を計量流路より短くする。すなわち隣接流路の容積を小さくすることにより、隣接流路に流れ込む試料の量を低減させる。

【0010】計量流路の終端すなわち隣接流路との境界面に隔離膜を設けることにより、試料が隣接流路への流れ込みを遮断させる。

【0011】

【作用】上記のようにすれば、サンプリングの際に試料が隣接流路に流入する量が少なくなり、より正確な計り採りができるようになる。結果として、再現性が上がる。

【0012】

【実施例】図3及び図4を用いて試料導入素子の実施例を説明する。

【0013】試料導入素子3は試料導入流路ａａ′と分析用流路ｂｂ′から構成し、交差部分ｃｃ′は計量流路にあたる。試料は注入ポート２０より注入する。計量流路ｃｃ′を試料で満たすようにドレイン側のバルブ5を一定時間開く。そのとき計量流路の終端に隔離膜２３を設けているため、試料が隣接流路に流入することができない。次にバルブ5が閉まる状態で電圧を印加し、計量流路部分の試料が泳動され、キャピラリー1に導かれる。

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【0014】図4に試料導入素子のもう一つの構成例を示す。隣接流路の内径が計量流路より小さくなっており、試料導入の際、抵抗の違いにより試料が隣接流路へ流れにくくなる。

【0015】次に図5を用いて装置全体の構成を説明する。キャピラリー1の一方を試料導入素子3を介して電極槽4に接続する。試料導入素子3のドレイン側にバルブ5を設け、試料導入時または洗浄時に開く状態に設定する。試料はシリンジ又はノズル8により注入され、その動作はサンプラ9により自動化されている。キャピラリー1の他方をレシーバ7を介して電極槽14に接続する。更にレシーバ7よりチューブなどでポンプ11に繋ぎ、ポンプを動作させることによってキャピラリーの洗浄を行なう。すなわちチューブの中間にバルブ15を設け、バルブ15およびバルブ5を開く状態にし、ポンプ11で洗浄液を送るように構成している。電極槽4，14にそれぞれ電極を設置し高電圧電源6に接続されている。高電圧電源6を作動させることにより、電気泳動を開始する。その際キャピラリー1および電極槽4，14にはあらかじめ電極液（泳動用緩衝液）が満たされている。

【0016】つぎにキャピラリー1の一部には検出器10が設置され、試料の分離状態が測定できる。通常光学検出器を用い、特に吸光光度計が多用されている。なお分析条件に応じた一定長さのキャピラリーがカセットケース2に収納され、装置全体の小型化やキャピラリー交換時の操作性向上を図っている。検出器10にて検出した信号は信号処理装置12に送られ、処理した結果を記録装置13に出力される。

【0017】さて、上記のような構成を作り、試料導入について評価し従来のものと比較した。キャピラリー1として、内径0.1㎜，外径0.375㎜，長さ300㎜の溶融石英毛細管を用いた。電極液として、酢酸緩衝液を用い、試料はアデノシンを用いた。検出には吸光光度計を用い、波長260nmでの吸光度を測定し記録した。各測定のピーク面積およびピークハイトを求めて評

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価した。結果を図6に示す。

【0018】図6に示すように従来法では、泳動パターンにテーリングが発生しているため、分解能低下ばかりか再現性不良を招くことになる。これに対して本発明による泳動パターンにテーリングが発生していないことが分かった。

【0019】再現性についても、従来の方法では繰返し再現性のCV値（％）は、ピーク面積で8.4％，ピークハイトで5.2％であった。一方、本発明による導入では、同CV値（％）は、それぞれ5.0％，2.7％であった。

【0020】以上のようにサンプリング再現性が改善され、本発明の有効性が確認できた。

【0021】

【発明の効果】本発明によれば、試料導入の際に、試料が隣接流路への流れ込みが抑えられ、より正確な計り採りができるため、サンプリング再現性の改善に有効である。また、移動部分がないので、安定した結果が得られるばかりでなく、自動化が簡単に行なえる利点を有する。

【図面の簡単な説明】

【図1】インジェクタの構成と動作原理を説明する図である。

【図2】試料導入の際における問題点を説明する図である。

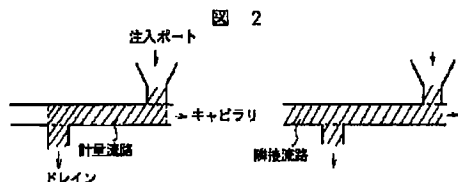【図3】本発明の一実施例の概略を示す図である。

【図4】本発明のもう一つの実施例を示す図である。

【図5】装置全体構成の概略図である。
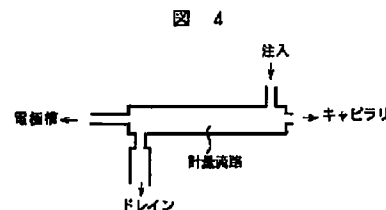
【図6】泳動パターンの違いを示す図である。

【符号の説明】

1…キャピラリー、2…カセットケース、3…試料導入素子、4，14…電極槽、5，15…バルブ、6…高電圧電源、7…レシーバ、8…シリンジ、9…サンプラ、10…吸光度光度計、11…ポンプ、12…信号処理装置、13…記録器、20…試料注入ポート、23…隔離膜。
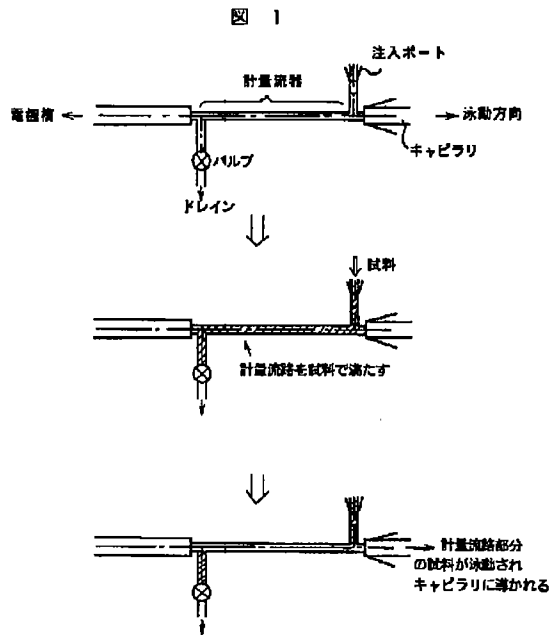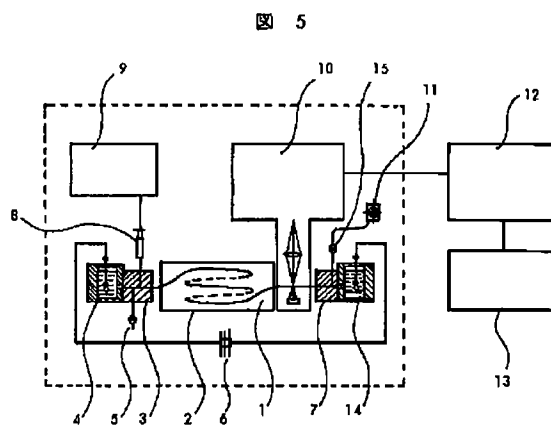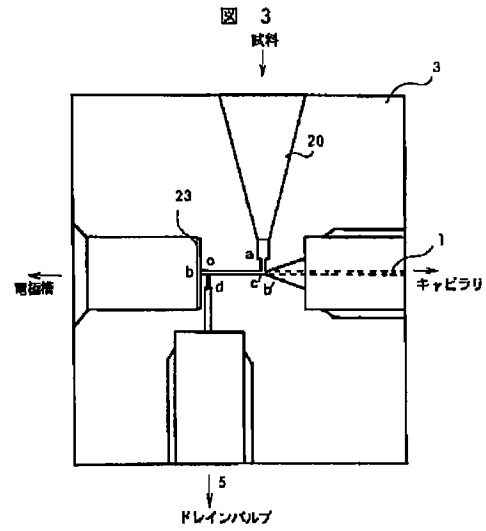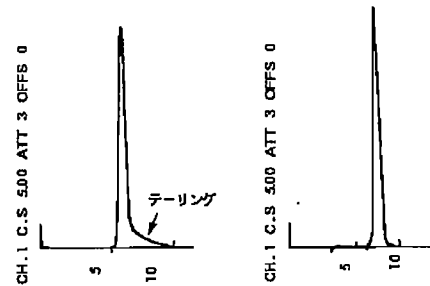
【図2】

図2

【図4】

図4

【図1】

図　1

【図3】

図　3

【図5】

図　5

【図6】

図　6

フロントページの続き

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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1]In an analysis apparatus which impresses voltage to both ends of a capillary tube which
filled a fluid, separates a sample introduced into one end of a capillary tube via a sample introduction
element, and is detected, A capillary electrophoresis device, wherein capacity of other channels
which the above-mentioned sample introduction element makes a channel for analysis and a sample
introduction passage cross, is constituted, measures a sample by a measuring channel equivalent to
a crossing portion, takes, and adjoin a measuring channel is farther [than a measuring channel]
small.
[Claim 2]A capillary electrophoresis device making a path of other channels contiguous to a
measuring channel smaller than a path of a measuring channel in the sample introduction element
according to claim 1.
[Claim 3]A capillary electrophoresis device making other channels contiguous to a measuring
channel shorter than a measuring channel in the sample introduction element according to claim 1.
[Claim 4]A capillary electrophoresis device providing an isolation film in a termination of a measuring
channel in the sample introduction element according to claim 1.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application]The method of conducting separation analysis of the minor constituent in a fluid is started, especially improvement in the sampling reproducibility of capillary electrophoresis is started.
[0002]
[Description of the Prior Art]Capillary electrophoresis attracts attention especially in recent years as separation analysis art of having highly efficient liquid chromatography (HPLC) and an advantage of gel electrophoresis.
[0003]About capillary electrophoresis, for example, analytical . a 61 chemistry 292A page–303A page (1989) (Analytical Chemistry, 61,292A–303A (1989)) –– analytical –– 61 volume 1186 pages – 1194 pages (1989) (Analytical.) Chemistry It is indicated to Chemistry, 61, and 1186-1194 (1989). The capillary tube of inside diameter abbreviation 25um to 250um which filled the buffer is used as a separation medium. A sample is introduced from one end, and while electrophoresis separates a sample in this, it is made to move to the end of another side. The detector which detects passage of a sample component is installed in the suitable position which exists in the move direction, and a separation pattern is recorded.
[0004]In capillary electrophoresis, although there are some methods in the sample introducing method, since all move a capillary tube or it has a buffer and a sample pipe in the capillary tube by turns, when raising analysis reproducibility, it has been a problem. The sample introducing method using an injector is developed apart from these methods. this method –– for example, JONARU OBUKUROMATO –– gruffy 452 volumes It is indicated to 615 – 622 pages (1988) (Journal of Chromatography, 452615–622 (1988)). In order to measure and take a sample by the measuring channel which an injector makes the channel for analysis, and a sample introduction passage cross, constitutes it, and is equivalent to a crossing portion, it is the feature that the good reproducibility for not being influenced by injection-rate change is acquired. The composition and the principle of operation of an injector are explained to drawing 1. A sample is poured in from an injection port. The valve by the side of a drain is opened fixed time so that a measuring channel may be filled with a sample. Voltage is impressed in the state where a valve is closed after that, the sample of a measuring flow channel part migrates, and it is led to a capillary tube.
[0005]
[Problem(s) to be Solved by the Invention]Since a sample is measured by the measuring channel in the sample introducing method using the above-mentioned injector, sampling reproducibility must be ideally good. however, other channels where a measuring channel adjoins are followed physically, and a sample flows into an adjoining channel according to hydrodynamics in the case of sample pouring, and ideal, as actually shown in drawing 2 –– it cannot measure, take and **. Especially this point poses a problem, when the capacity of a measuring channel is small.

[0006]The purpose of this invention is to raise the reproducibility of a sampling.
[0007]
[Means for Solving the Problem]What is necessary is just to make capacity of an adjoining channel reduce or intercept by the following methods, in order to solve an aforementioned problem.
[0008]A path of an adjoining channel is made smaller than a path of a measuring channel. That is, a level difference is provided in a channel and a sample reduces an influx to an adjoining channel by the difference in resistance.
[0009]An adjoining channel is made shorter than a measuring channel. That is, by making capacity of an adjoining channel small, quantity of a sample which flows into an adjoining channel is reduced.
[0010]A sample makes an influx to an adjoining channel intercept by providing an isolation film in a termination of a measuring channel, i.e., an interface with an adjoining channel.
[0011]
[Function]the quantity in which a sample flows into an adjoining channel in the case of a sampling decreases, and more exact, if it is performed above —— it can measure, take and ** now. Reproducibility goes up as a result.
[0012]
[Example]The example of a sample introduction element is described using drawing 3 and drawing 4.
[0013]Constituting the sample introduction element 3 from sample introduction passage aa' and channel bbfor analysis ', crossing portion cc' hits a measuring channel. A sample is poured in from the injection port 20. The valve 5 by the side of a drain is opened fixed time so that measuring channel cc' may be filled with a sample. Since the isolation film 23 is then formed in the termination of the measuring channel, a sample cannot flow into an adjoining channel. Next, voltage is impressed in the state where the valve 5 is closed, the sample of a measuring flow channel part migrates, and it is led to the capillary tube 1.
[0014]Another example of composition of a sample introduction element is shown in drawing 4. The inside diameter of the adjoining channel is smaller than a measuring channel, and it becomes difficult to flow through a sample by the difference in resistance into an adjoining channel in the case of sample introduction.
[0015]Next, the composition of the whole device is explained using drawing 5. One side of the capillary tube 1 is connected to the electrode tub 4 via the sample introduction element 3. The valve 5 is formed in the drain side of the sample introduction element 3, and it is set as the state of opening at the time of sample introduction or washing. A sample is poured in by the syringe or the nozzle 8, and the operation is automated by the sampler 9. Another side of the capillary tube 1 is connected to the electrode tub 14 via the receiver 7. A tube etc. tie to the pump 11 from the receiver 7, and a capillary tube is washed by operating a pump. That is, the valve 15 is formed in the middle of a tube and it changes into the state of opening the valve 15 and the valve 5, and it constitutes so that a penetrant remover may be sent with the pump 11. An electrode is installed in the electrode tubs 4 and 14, respectively, and it is connected to the high voltage power 6. Electrophoresis is started by operating the high voltage power 6. In that case, electrode liquid (buffer solution for migration) is beforehand filled by the capillary tube 1 and the electrode tubs 4 and 14.
[0016]Next, the detector 10 is installed in a part of capillary tube 1, and the separation state of a sample can be measured. Usually, especially the absorptiometer is used abundantly using the optical detector. The capillary tube of the fixed length according to an analysis condition is stored by the cassette case 2, and improvement in operativity at the time of a miniaturization and capillary tube exchange of the whole device is aimed at. The signal detected with the detector 10 is sent to the signal processor 12, and the processed result is outputted to the recorder 13.
[0017]Now, the above composition was made, sample introduction was evaluated and it compared with the conventional thing. As the capillary tube 1, a fused-quartz capillary tube 0.1 mm in inside diameter, the outer diameter of 0.375 mm, and 300 mm in length was used. The sample used

adenosine, using acetic acid buffer solution as electrode liquid. The absorbance in the wavelength of 260 nm was measured and recorded on detection using the absorptiometer. It evaluated in quest of the peak area and peak height of each measurement. A result is shown in drawing 6.

[0018]As shown in drawing 6, since the tailing has occurred to the migration pattern, in a conventional method, not only a resolution fall but poor reproducibility will be caused. On the other hand, it turned out that the tailing has not occurred to the migration pattern by this invention.

[0019]The CV value (%) of reproducibility was 5.2% [reproducibility / method / conventional] in peak height 8.4% at the peak area. On the other hand, in introduction by this invention, the CV values (%) were 5.0% and 2.7%, respectively.

[0020]Sampling reproducibility has been improved as mentioned above and the validity of this invention has been checked.

[0021]
[Effect of the Invention]According to this invention, an influx to an adjoining channel is stopped in the case of sample introduction, and since [being more exact] it can measure, take and **, a sample is effective in an improvement of sampling reproducibility. Since there is no moving part, the result of having been stabilized is not only obtained, but it has an advantage which can perform automation easily.

[Translation done.]

* NOTICES *

TECHNICAL FIELD

[Industrial Application]The method of conducting separation analysis of the minor constituent in a
fluid is started, especially improvement in the sampling reproducibility of capillary electrophoresis is
started.

[Translation done.]

* NOTICES *

PRIOR ART

[Description of the Prior Art]Capillary electrophoresis attracts attention especially in recent years
as separation analysis art of having highly efficient liquid chromatography (HPLC) and an advantage
of gel electrophoresis.
[0003]About capillary electrophoresis, for example, analytical . a 61 chemistry 292A page–303A page
(1989) (Analytical Chemistry, 61,292A–303A (1989)) –– analytical –– 61 volume 1186 pages – 1194
pages (1989) (Analytical.) Chemistry It is indicated to Chemistry, 61, and 1186–1194 (1989). The
capillary tube of inside diameter abbreviation 25um to 250um which filled the buffer is used as a
separation medium. A sample is introduced from one end, and while electrophoresis separates a
sample in this, it is made to move to the end of another side. The detector which detects passage
of a sample component is installed in the suitable position which exists in the move direction, and a
separation pattern is recorded.
[0004]In capillary electrophoresis, although there are some methods in the sample introducing
method, since all move a capillary tube or it has a buffer and a sample pipe in the capillary tube by
turns, when raising analysis reproducibility, it has been a problem. The sample introducing method
using an injector is developed apart from these methods. this method –– for example, JONARU
OBUKUROMATO –– gruffy 452 volumes It is indicated to 615 – 622 pages (1988) (Journal of
Chromatography, 452615–622 (1988)). In order to measure and take a sample by the measuring
channel which an injector makes the channel for analysis, and a sample introduction passage cross,
constitutes it, and is equivalent to a crossing portion, it is the feature that the good reproducibility
for not being influenced by injection–rate change is acquired. The composition and the principle of
operation of an injector are explained to drawing 1. A sample is poured in from an injection port. The
valve by the side of a drain is opened fixed time so that a measuring channel may be filled with a
sample. Voltage is impressed in the state where a valve is closed after that, the sample of a
measuring flow channel part migrates, and it is led to a capillary tube.

[Translation done.]

* NOTICES *

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EFFECT OF THE INVENTION

[Effect of the Invention]According to this invention, an influx to an adjoining channel is stopped in
the case of sample introduction, and since [being more exact] it can measure, take and **, a
sample is effective in an improvement of sampling reproducibility. Since there is no moving part, the
result of having been stabilized is not only obtained, but it has an advantage which can perform
automation easily.

[Translation done.]

* NOTICES *

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]Since a sample is measured by the measuring channel in
the sample introducing method using the above-mentioned injector, sampling reproducibility must be
ideally good. however, other channels where a measuring channel adjoins are followed physically, and
a sample flows into an adjoining channel according to hydrodynamics in the case of sample pouring,
and ideal, as actually shown in drawing 2 -- it cannot measure, take and **. Especially this point
poses a problem, when the capacity of a measuring channel is small.
[0006]The purpose of this invention is to raise the reproducibility of a sampling.

[Translation done.]

* NOTICES *

MEANS

[Means for Solving the Problem]What is necessary is just to make capacity of an adjoining channel
reduce or intercept by the following methods, in order to solve an aforementioned problem.
[0008]A path of an adjoining channel is made smaller than a path of a measuring channel. That is, a
level difference is provided in a channel and a sample reduces an influx to an adjoining channel by
the difference in resistance.
[0009]An adjoining channel is made shorter than a measuring channel. That is, by making capacity of
an adjoining channel small, quantity of a sample which flows into an adjoining channel is reduced.
[0010]A sample makes an influx to an adjoining channel intercept by providing an isolation film in a
termination of a measuring channel, i.e., an interface with an adjoining channel.

[Translation done.]

* NOTICES *

OPERATION

[Function]the quantity in which a sample flows into an adjoining channel in the case of a sampling
decreases, and more exact, if it is performed above —— it can measure, take and ** now.
Reproducibility goes up as a result.

[Translation done.]

EXAMPLE

[Example]The example of a sample introduction element is described using drawing 3 and drawing 4.
[0013]Constituting the sample introduction element 3 from sample introduction passage aa' and
channel bbfor analysis ', crossing portion cc' hits a measuring channel. A sample is poured in from
the injection port 20. The valve 5 by the side of a drain is opened fixed time so that measuring
channel cc' may be filled with a sample. Since the isolation film 23 is then formed in the termination
of the measuring channel, a sample cannot flow into an adjoining channel. Next, voltage is impressed
in the state where the valve 5 is closed, the sample of a measuring flow channel part migrates, and
it is led to the capillary tube 1.
[0014]Another example of composition of a sample introduction element is shown in drawing 4. The
inside diameter of the adjoining channel is smaller than a measuring channel, and it becomes difficult
to flow through a sample by the difference in resistance into an adjoining channel in the case of
sample introduction.
[0015]Next, the composition of the whole device is explained using drawing 5. One side of the
capillary tube 1 is connected to the electrode tub 4 via the sample introduction element 3. The
valve 5 is formed in the drain side of the sample introduction element 3, and it is set as the state of
opening at the time of sample introduction or washing. A sample is poured in by the syringe or the
nozzle 8, and the operation is automated by the sampler 9. Another side of the capillary tube 1 is
connected to the electrode tub 14 via the receiver 7. A tube etc. tie to the pump 11 from the
receiver 7, and a capillary tube is washed by operating a pump. That is, the valve 15 is formed in the
middle of a tube and it changes into the state of opening the valve 15 and the valve 5, and it
constitutes so that a penetrant remover may be sent with the pump 11. An electrode is installed in
the electrode tubs 4 and 14, respectively, and it is connected to the high voltage power 6.
Electrophoresis is started by operating the high voltage power 6. In that case, electrode liquid
(buffer solution for migration) is beforehand filled by the capillary tube 1 and the electrode tubs 4
and 14.
[0016]Next, the detector 10 is installed in a part of capillary tube 1, and the separation state of a
sample can be measured. Usually, especially the absorptiometer is used abundantly using the optical
detector. The capillary tube of the fixed length according to an analysis condition is stored by the
cassette case 2, and improvement in operativity at the time of a miniaturization and capillary tube
exchange of the whole device is aimed at. The signal detected with the detector 10 is sent to the
signal processor 12, and the processed result is outputted to the recorder 13.
[0017]Now, the above composition was made, sample introduction was evaluated and it compared
with the conventional thing. As the capillary tube 1, a fused-quartz capillary tube 0.1 mm in inside
diameter, the outer diameter of 0.375 mm, and 300 mm in length was used. The sample used
adenosine, using acetic acid buffer solution as electrode liquid. The absorbance in the wavelength of
260 nm was measured and recorded on detection using the absorptiometer. It evaluated in quest of
the peak area and peak height of each measurement. A result is shown in drawing 6.

[0018]As shown in <u>drawing 6</u>, since the tailing has occurred to the migration pattern, in a conventional method, not only a resolution fall but poor reproducibility will be caused. On the other hand, it turned out that the tailing has not occurred to the migration pattern by this invention.
[0019]The CV value (%) of reproducibility was 5.2% [reproducibility / method / conventional] in peak height 8.4% at the peak area. On the other hand, in introduction by this invention, the CV values (%) were 5.0% and 2.7%, respectively.
[0020]Sampling reproducibility has been improved as mentioned above and the validity of this invention has been checked.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a figure explaining the composition and the principle of operation of an injector.
[Drawing 2]It is a figure explaining the problem in the case of sample introduction.
[Drawing 3]It is a figure showing the outline of one example of this invention.
[Drawing 4]It is a figure showing another example of this invention.
[Drawing 5]It is a schematic diagram of a device entire configuration.
[Drawing 6]It is a figure showing the difference in a migration pattern.
[Description of Notations]
1 [—- Electrode tub,] —- A capillary tube, 2 —- A cassette case, 3 —- A sample introduction
element, 4, 14 5, 15 [—- A syringe, 9 / —- A sampler, 10 / —- An absorbance photometer, 11 / —- A
pump, 12 / —- A signal processor, 13 / —- A recorder, 20 / —- A sample injection port, 23 / —-
Isolation film.] —- A valve, 6 —- High voltage power, 7 —- A receiver, 8

[Translation done.]
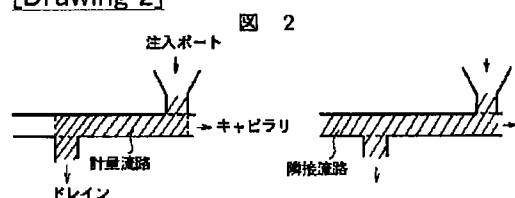
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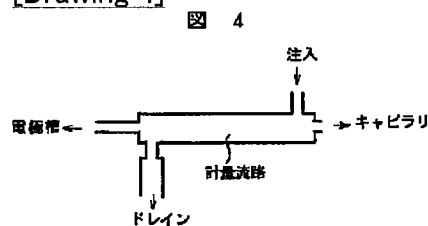damages caused by the use of this translation.

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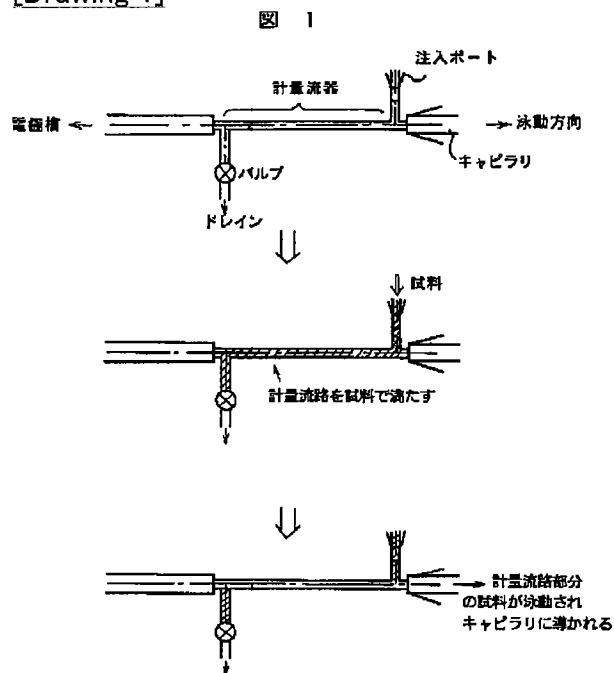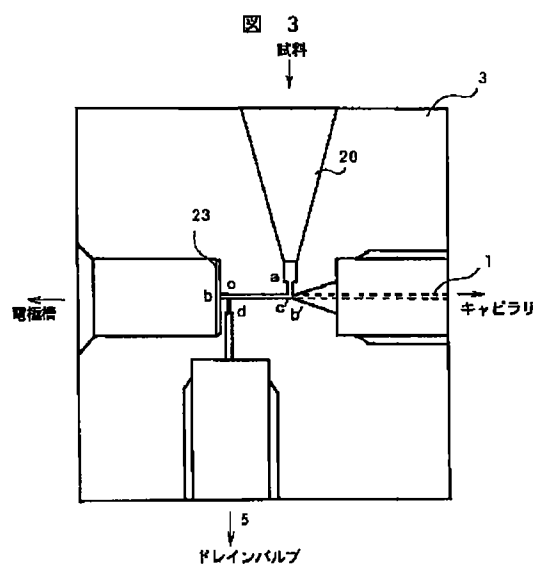3.In the drawings, any words are not translated.

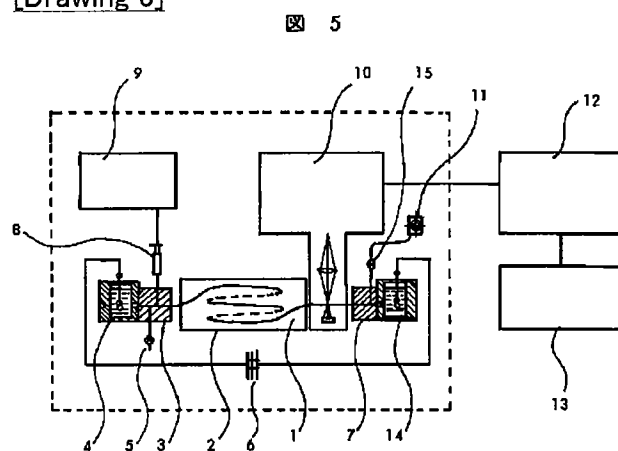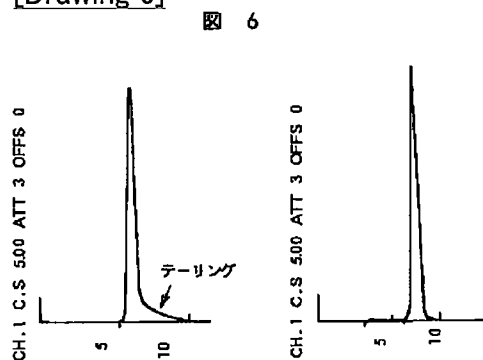## DRAWINGS

[Drawing 2]

図 2

[Drawing 4]

図 4

[Drawing 1]

図 1

[Drawing 3]

図　3

試料

電極信

キャピラリ

ドレインバルブ

[Drawing 5]

図　5

[Drawing 6]

図　6

テーリング

[Translation done.]